

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended): A high concentration silica slurry, ~~comprising~~
consisting of:

a silica powder dispersed in ~~an~~ a solvent,

said solvent consisting of at least one selected from the group consisting of water and
alcohols,

said silica slurry having a silica concentration of more than 50 % by weight and a
viscosity of less than 1000 mPa·s,

wherein said silica powder has a ratio DL/DT of less than 1.3, wherein DL is an
average particle size of the silica powder measured by a laser diffraction particle size
distribution method and DT is an average primary particle size of the silica powder measured
by a TEM photography observation,

wherein a ratio B/A is less than 1.5, where A is the viscosity of the slurry measured at
the time of preparing and B is the viscosity after one month, and

wherein said silica powder has an average primary particle size of from 0.08 μ m to
0.8 μ m

~~, wherein said silica powder is fumed silica produced by a dry process, and~~

~~wherein said silica powder has impurity concentrations of less than 1.0 ppm of each~~
~~of sodium and potassium, less than 1.0 ppm of aluminum, and less than 5 ppm of each of~~
~~sulfur, nickel, chromium, and iron.~~

Claim 2 (Original): The high concentration silica slurry according to Claim 1,
wherein the silica concentration is from more than 70 % by weight to less than 80 % by
weight and the viscosity is less than 800 mPa·s at the time of preparing.

Claims 3-4 (Canceled)

Claim 5 (Original): The high concentration silica slurry according to Claim 1, wherein said solvent is water.

Claim 6 (Original): The high concentration silica slurry according to Claim 1, wherein at least two silica powders with different particle sizes are used.

Claim 7 (Currently Amended): A polishing composite, comprising:
the high concentration silica slurry ~~according to~~ of Claim 1.

Claim 8 (Original): The polishing composite according to Claim 7, wherein the silica concentration is from more than 70 % by weight to less than 80 % by weight and the viscosity is less than 800 mPa·s at the time of preparing.

Claim 9 (Canceled)

Claim 10 (Original): The polishing composite according to Claim 7, wherein the impurity concentrations of said silica powder are less than 1.0 ppm of each of sodium and potassium, less than 1.0 ppm of aluminum, and less than 5 ppm of each of sulfur, nickel, chromium, and iron.

Claim 11 (Original): The polishing composite according to Claim 7, wherein said solvent is water.

Claim 12 (Original): The polishing composite according to Claim 7, wherein at least two silica powders with different particle sizes are used.

Claim 13 (Currently Amended): A process for polishing a substrate, comprising:
contacting the surface of said substrate with the slurry ~~according to~~ of Claim 1.

Claim 14 (Original): The process according to Claim 13, wherein said substrate is a silicon wafer.

Claim 15 (Original): The process according to Claim 13, wherein the silica concentration is from more than 70 % by weight to less than 80 % by weight and the viscosity is less than 800 mPa•s at the time of preparing.

Claim 16 (Canceled)

Claim 17 (Original): The process according to Claim 13, wherein impurity concentrations of said silica powder are less than 1.0 ppm of each of sodium and potassium, less than 1.0 ppm of aluminum, and less than 5 ppm of each of sulfur, nickel, chromium, and iron.

Claim 18 (Original): The process according to Claim 13, wherein said solvent is water.

Claim 19 (Original): The process according to Claim 13, wherein at least two silica powders with different particle sizes are used.

Claim 20 (Original): The process according to Claim 13, wherein said substrate is a semiconductor material.

Claim 21 (New): The high concentration silica slurry according to Claim 1, wherein impurity concentrations of said silica powder are less than 1.0 ppm of each of sodium and potassium, less than 1.0 ppm of aluminum, and less than 5 ppm of each of sulfur, nickel, chromium, and iron.

Claim 22 (New): The high concentration silica slurry according to Claim 1, wherein the water is distilled water.

Claim 23 (New): The high concentration silica slurry according to Claim 1, wherein the alcohols are alcohols having from 1 to 4 carbon atoms.

Claim 24 (New): The high concentration silica slurry according to Claim 1, wherein the solvent consists of at least one selected from the group consisting of distilled water and alcohols having from 1 to 4 carbon atoms.

SUPPORT FOR THE AMENDMENTS

This Amendment cancels Claims 3, 9 and 16; amends Claims 1, 7 and 13; and adds new Claims 21-24. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claim 1 is found in canceled Claim 3; in Claims 5, 11 and 18; and in the specification at least at page 8, lines 13-15. Support for new Claim 21 is found in original Claim 4. Support for new Claims 22-24 is found in the specification at least at page 8, lines 13-15. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-2, 5-8, 10-15 and 17-24 will be pending in this application. Claim 1 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the courtesies extended to their representative during the July 28, 2005, personal interview.

As discussed at the interview, the present invention relates to a silica slurry that can be used for polishing semiconductor materials. To obtain polishing accuracy and speed, it is necessary that silica powder be well dispersed in the slurry, that the slurry have low viscosity, and that the slurry viscosity exhibit stability with the passage of time even for high silica concentrations. See, specification at page 2, lines 10-13.

In conventional silica dispersion slurries, the silica concentration is limited to less than about 40%. If the silica concentration is more than 40%, slurry flowability is easily lost and viscosity stability with the passage of time is low. This is particularly a problem with slurries containing fine silica powder, e.g., fumed silica having an average primary particle

size of from 7 to 50 nm. Agglomeration of fine silica powder frequently occurs, which results in a particle size at the time of polishing that is not uniform, and a viscosity change with the passage of time that is large. Specification at page 2, lines 14-22.

In contrast, the present invention provides a silica slurry having a low viscosity of less than 1000 mPa•s even for a silica concentration of more than 50% by weight. Furthermore, the silica slurry of the present invention exhibits little viscosity change with the passage of time. These slurry characteristics are achieved by using a silica powder in which (i) the average primary particle size (DT) is in a range of from 0.08 μ m to 0.8 μ m and (ii) the ratio (DL/DT) of the average particle size (DL) and the average primary particle size (DT) is less than 1.3. Specification at page 8, line 27 to page 9, line 6. The ratio (DL/DT) reflects the agglomeration of particles. Specification at page 5, lines 26-27.

In the field of semiconductor polishing, a slurry using colloidal silica has good dispersibility and stability, but low purity. In contrast, a slurry using fumed silica has high purity, but poor dispersibility and stability. The high concentration silica slurry of the present invention combines high purity with good dispersibility and stability.

Claims 1 and 5-6 are rejected under 35 U.S.C. § 103(a) over U.S. Patent Application Publ. No. US 2003/0103814 ("Greenwood-814"). However, Claim 3 is not rejected over Greenwood-814. Claim 3 is incorporated into independent Claim 1. Thus, the rejection over Greenwood-814 should be withdrawn.

Claims 1-3 and 5-20 are rejected under 35 U.S.C. § 103(a) over U.S. Patent Application Publ. No. US 2004/0077768 ("Greenwood-768") alone or in view of U.S. Patent No. 4,588,421 ("Payne"). Greenwood-768 discloses a stable substantially aqueous silanized colloidal silica dispersion that is produced by mixing a silane compound and colloidal silica particles. Greenwood-768 at abstract. However, Greenwood-768 fails to suggest the independent Claim 1 limitation of a "high concentration silica slurry, *consisting of*: a silica

powder dispersed in a solvent, said solvent **consisting of** at least one selected from the group consisting of water and alcohols". The bolded terms "consisting of" exclude from the recited "slurry" the silane compound required by Greenwood-768. Payne fails to suggest that Greenwood-768 should not include the silane compound required by Greenwood-768. Because the cited prior art fails to suggest all the limitations of independent Claim 1, the rejection over Greenwood-768 alone or in view of Payne should be withdrawn.

Claims 1, 3 and 5-6 are rejected under 35 U.S.C. § 103(a) over JP 2001-152134 ("JP-134"). JP-134 discloses an abrasive composition for oxide single crystal wafers is a colloidal solution which contains silica oxide particles and a component which imparts an electrical conductivity. JP-134 at abstract. However, JP-134 fails to suggest the independent Claim 1 limitation of a "high concentration silica slurry, **consisting of**: a silica powder dispersed in a solvent, said solvent **consisting of** at least one selected from the group consisting of water and alcohols". The bolded terms "consisting of" exclude from the recited "slurry" the component which imparts an electrical conductivity required by JP-134. Because JP-134 fails to suggest all the limitations of independent Claim 1, the rejection over JP-134 should be withdrawn.

Claims 1-3 (sic) and 5-20 are rejected under 35 U.S.C. § 103(a) over U.S. Patent Application Publ. No. US 2003/0124045 ("Kobayashi") in view of U.S. Patent No. 6,740,589 ("Shimazu") and Payne. Applicants respectfully traverse the rejection because Kobayashi is not prior art to the above-identified application. Kobayashi was filed on December 23, 2002. In contrast, the above-identified application claims the priority of JP 2002-339402 of November 22, 2002. To perfect Applicants' claim to priority under 37 C.F.R. 1.55, attached is an English-language translation of JP 2002-339402 and a certification from the translator. Because Kobayashi was filed after Applicants' priority date, Kobayashi is not prior art to the

above-identified application. Thus, the rejection over Kobayashi in view of Shimazu and Payne should be withdrawn.

Claims 10 and 17 are rejected under 35 U.S.C. § 112, second paragraph. To obviate the rejection the limitations of Claims 10 and 17 are deleted from Claim 1.

In view of the foregoing remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Attached:

English-language translation of JP 2002-339402 and translator's certification

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